

The Discovery of Vitamin C

Albert Szent-Gyorgyi, M.D., Ph.D.

1893 - 1986

**"... to see what everyone else has seen,
but think what no one else has thought."**

A. Hoffer, M.D., Ph.D.¹

Ascorbic acid is made by living cells from glucose and protects animals from developing scurvy. A few species, including man and guinea pigs, are not able to make this vitamin, depending wholly on Vitamin C present in food. We have lost the gene upon which the final transformation to Vitamin C (ascorbic acid) depends.

Scurvy has been a scourge for thousands of years, or as soon as mankind began to depend on food sources deficient in Vitamin C. The proof that certain foods cure and prevent scurvy, and that the active principle is ascorbic acid, is associated with a small number of physicians and scientists. These include Sir James Lind, the British naval surgeon who first proved using controlled experiments that citrus fruit was anti-scorbutic. The British navy delayed acting on his discovery for at least forty years, losing about 100,000 seamen from scurvy. After they began to feed their sailors limes they were able to control scurvy. This is one of the factors which saved Britain from Napoleon's fleet; French sailors at sea became sick with scurvy too soon. Other scientists were Dr. Szent-Gyorgyi, Dr. N. Haward and Dr. C. G. King, but of all these, Dr. Szent-Gyorgyi stands far above any other, and he was awarded the Nobel Prize in 1937.

Dr. A. Szent-Gyorgyi died in October 1986, when he was ninety-three years old. Recently Ralph W. Moss published *Free Radical: Albert Szent-Gyorgyi and the Battle Over Vitamin C*, (1988). It is an excellent account of the life history of a remarkable person and scientist. I found the story of how ascorbic acid was finally identified fascinating.

In 1925, when he was thirty-two years old, Dr. Szent-Gyorgyi became interested in biological oxidation. At that time there was a debate between scientists who emphasized the role of oxygen and those who emphasized the role of hydrogen as reducing substances. Dr. Szent-Gyorgyi showed that both were involved but that an intermediary compound like succinic acid was involved. Dr. Szent-Gyorgyi became excited by the bronzing of skin of patients with Addison's disease, and the brown pigmentation which develops when certain vegetables or fruits are cut, like potatoes, apples and pears. He showed that fruits which do not turn brown contain a substance which suppresses this oxidation — it is an antioxidant. But *it* was also present in adrenal glands. However, the main source was orange juice and cabbage juice. Before the substance could be identified it would have to be crystallized and then its exact chemical structure identified.

Dr. Szent-Gyorgyi moved to London where he worked with Sir Henry Dale. Later he moved to Cambridge, England, and eventually extracted 1 gram from orange juice and cabbage juice. But he did not know what the compound was. In his first paper he therefore called it "ignose" from ignosco (I don't know). He added "ose" because it was derived from sugar (glucose). The editor of the journal to whom he had submitted the paper did not like that word. Then Szent-Gyorgyi suggested "Godnose". This nearly cost him his Nobel Prize,, for the editor indignantly rejected this second term and suggested instead it be called "hexuronic acid". This it is not. Had his paper not been published, his research career might have taken a different direction. He won his Ph.D. from

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this research.

In 1929 he was invited to do his work in Rochester, Minnesota, at the Mayo Clinic where Dr. E. C. Kendall was doing his research. He was attracted to the Mayo Clinic because he was promised adequate facilities and a huge source of adrenal glands from the slaughterhouse of St. Paul, Minnesota. The adrenal gland is a rich source of ascorbic acid, one of the richest sources in the body. While there he isolated 30 grams of "hexuronic acid", as it was now called, from thousands of pounds of adrenal glands. He sent 10 grams to Dr. N. Hawarth, one of the world's best sugar chemists. But there was not enough for him to do so. Dr. Szent-Gyorgyi kept 10 grams which he took with him back to his own country, to Szeged, Hungary, in 1930. He had been given a laboratory to start an institute.

In 1931, Dr. J. Svirbely from Pittsburg joined him. He had worked with Dr. C. G. King for his Ph.D. and had been working on methods of measuring the anti-scorbutic factor. When he arrived in Dr. Szent-Gyorgyi's lab, he told him he could tell whether something contained Vitamin C. Dr. Szent-Gyorgyi then pulled out his 10 grams of crystalline "hexuronic acid" and said, "... here, test this, I think this is Vitamin C." He had suspected this for several years but had not proof. He was not really interested in vitamins and had no use for the study of nutrition. He believed, "Vitamins are of relatively little fundamental scientific interest."

Other investigators were hot on the trail. Thus, Dr. Karl Link in Wisconsin had prepared several grams of impure calcium ascorbate but his Dean would not give him any money to test it on guinea pigs. Dr. C. G. King in Pittsburgh was also getting close. Later, King and Szent-Gyorgyi were involved in a hot debate over priority.

A few months after Sverbely began his studies, he proved that Dr. Szent-Gyorgyi's "hexuronic acid", was Vitamin C. Early in 1932, Sverbely wrote to Dr. King, telling him of his experiments and conclusion. His chief, Szent-Gyorgyi, had urged him to do so. April 1932, *Science* published a letter from C. G. King, announcing that "hexuronic acid" was Vitamin C. The

bitter debate was on. Soon after that, *Nature* carried a letter from Szent-Gyorgyi with his announcement. Pretty soon, U.S. science squared off against European science. The controversy was settled when A. Szent-Gyorgi, not C. G. King, won the Nobel Prize in 1937. The U.S. patent office rejected King's application for a patent in 1932, concluding he had no priority.

It is apparent the mutual dislike between these two scientists never died. Over the past twenty years the Orthomolecular era was introduced by Linus Pauling; Dr. Szent-Gyorgyi jumped in on Pauling's side to support his *view* that optimum doses, no matter how large, are much more important than the tiny vitamin doses supported by nutritionists, dietitians, and biochemists. Dr. C. G. King remained with the establishment, vigorously opposed to the use of mega doses. Dr. A. Szent-Gyorgyi took large doses of ascorbic acid with his breakfast, combined with wheat germ. He was convinced wheat germ also had anti-cold properties. About ten years before he died, he was very ill. On Linus Pauling's advice he increased his consumption of Vitamin C and recovered. Now we all know that "hexuronic acid" was Vitamin C. But what was "hexuronic acid". Fortunately, Dr. Szent-Gyorgyi did not like paprika, yet his institute was in Szeged, the paprika capital of Hungary. Vitamin C was required in large amounts so that its structure and properties could be discovered. It was too difficult to obtain it from orange juice or adrenal glands. One evening, Dr. Szent-Gyorgyi took the paprika he had been served with dinner to his laboratory. He had realized he had never tested it for Vitamin C content. To his delight, he found it was five to six times as rich *in* Vitamin C as orange juice. Within one week his institute had isolated three pounds of Vitamin C. He promptly sent some to Dr. Hawarth who soon proved its structure and that it was *not* hexuronic acid. Dr. Szent-Gyorgyi's word "ignose" was more accurate than the editor's word, hexuronic acid. In 1937, the same year Szent-Gyorgyi won his Nobel Prize for physiology and medicine, Dr. Hawarth won his for chemistry. Dr. Szent-Gyorgyi was forty-four years old.

Today, ascorbic acid is synthesized by

the ton and distributed all over as a pure crystalline powder. As a vitamin its impact on medicine was enormous. But its use in mega doses, first started by Dr. F. Klenner in the U.S.A. and by our group in Canada about the same time, marked a major development in the field of human health. This was highlighted by Dr. I. Stone and Dr. Linus Pauling. Dr. Pauling risked his enormous scientific credibility by his views on using large doses of vitamins. His work on Vitamin C and the common cold and the flu, and later on the role it plays in controlling the ravages of cancer are well known and, in the opinion of Orthomolecular

scientists, are correct. We have come to the same conclusions by observing what Vitamin C has done for tens of thousands of patients. It is the most remarkable anti-stress antioxidant and is finding its place in the treatment of more and more difficult chronic diseases including AIDS, cancer, infections, toxemias, schizophrenia and more.

Reference

1. Moss RW: *Free Radical: Albert Szent-Gyorgyi and the Battle Over Vitamin C*. Paragon House Publishers, New York, 1988.